

What is claimed is:

1           1. A solid-state imaging element, comprising:  
2                   a plurality of light-receiving sensors converting optical signals to electrical  
3                   signals; and  
4                   a memory storing the electrical signals as optical image data, said memory being  
5                   formed of a plurality of line buffers.

1           2. The solid-state imaging element of claim 1, further comprising:  
2                   a first switch circuit connecting one of the line buffers and said light-receiving  
3                   sensors.

1           3. The solid-state imaging element of claim 2, wherein the data in the line  
2                   buffers are output in parallel.

1           4. The solid-state imaging element of claim 1, further comprising:  
2                   a second switch circuit selecting one of the line buffers to output the electrical  
3                   signal.

1           5. A solid-state imaging element, comprising:

1           a plurality of light receiving sensors arranged as m sensors in each of n lines  
2        to convert optical signals to electrical signals; and  
3           a memory storing the electrical signals as optical image data, said memory  
4        being formed of a plurality of buffers, each buffer storing m data.

1       6.      The solid-state imaging element of claim 5, further comprising:  
2           a switch circuit connecting one of the buffers and said light-receiving sensors.

1       7.      The solid-state imaging element of claim 6, further comprising:  
2           a transfer control circuit selecting certain ones of said light-receiving sensors  
3        to supply the electrical signal to the buffers.

1       8.      An image processor, comprising:  
2           a solid-state imaging element comprising a plurality of light receiving sensors  
3        to convert optical signals to electrical signals;  
4           an encoder encoding the electrical signals in units of n x m pixels; and  
5           an electrical signal holder within said solid-state imaging element comprising  
6        line buffers.

1       9.      The image processor of claim 8, further comprising:  
2        a first switch circuit connecting one of the line buffers and the light receiving sensors.

1           10. The image processor of claim 9, wherein data in the line buffers are output in  
2 parallel.

1           11. The image processor of claim 8, further comprising:  
2                 a second switch circuit selecting one of the line buffers and outputting an  
3 electrical signal thereto.

1           12. The image processor of claim 8, wherein said encoder is a JPEG encoder.

1           13. An image processor, comprising:  
2                 a solid-state imaging element having a plurality of light-receiving sensors to  
3 convert optical signals into electrical signals;  
4                 a code encoder encoding the electrical signals in units of  $n \times m$  pixels; and  
5                 an electrical signal holder within said solid-state imaging element comprising  
6 a plurality of buffers, each buffer storing  $m$  data.

1           14. The image processor of claim 13, further comprising:  
2                 a switch circuit connecting one of the buffers and the light-receiving sensors.

1           15. The image processor of claim 13, further comprising:

1                   a transfer control circuit selecting certain ones of the light-receiving sensors  
2                   to supply an electrical signal to the buffers.

1                 16. The image processor of claim 13, wherein said code encoder is a JPEG  
2                   encoder.

1                 17. An image processing method, comprising:  
2                   converting optical signals to electrical signals in a plurality of light-receiving  
3                   sensors;  
4                   outputting the electrical signals in units of  $n \times m$  blocks of pixels; and  
5                   encoding the electrical signals.

1                 18. A charge-coupled device (CCD), comprising:  
2                   a vertical CCD having a plurality of photosensors arranged in  $v$  vertical lines  
3                   and  $n$  horizontal lines corresponding to an  $n \times v$  frame of pixels, and converting optical  
4                   signals to electrical signal image data;  
5                   a horizontal CCD having  $n$  line buffers, each buffer holding up to  $v$  pixels of  
6                   image data;  
7                   a first switch circuit connected to each of the vertical lines and the line  
8                   buffers;

1           a first switch control circuit controlling said first switch circuit so that each  
2       line buffer sequentially connects to said vertical CCD, the image data in sequential ones of  
3       the n horizontal lines of said vertical CCD being transferred to a corresponding one of the n  
4       line buffers;

5           a second switch circuit connected to the line buffers and an external circuit;  
6       and

7           a second switch control circuit controlling said second switch circuit so that  
8       each line buffer sequentially connects to the external circuit, the image data in the line  
9       buffers being transferred to the external circuit in blocks of  $n \times m$  ( $m < v$ ) pixels, each line  
10      buffer in each block transferring m pixels.

1           19. A charge-coupled device (CCD), comprising:

2           a vertical CCD having a plurality of photosensors arranged in v vertical lines  
3       and n horizontal lines corresponding to an  $n \times v$  frame of pixels, each horizontal line being  
4       divided into k line sections, each line section corresponding to m ( $m < k$ ) pixels of image  
5       data, and converting optical signals to electrical signal image data;

6           a horizontal CCD having k line buffers connected to an external circuit, each  
7       line buffer holding up to m pixels of image data;

8           a switch circuit connected to the line buffers and the external circuit;

9           a transfer control circuit controlling said vertical CCD such that blocks of  $n \times$   
10      m pixels of image data are transferred from said vertical CCD to the line buffers, wherein a

1 first one of the buffers receives m pixels from a horizontal line and outputs the m pixels to  
2 the external circuit before receiving another m pixels from the next horizontal line and so  
3 forth until a first block of n x m pixels has been transferred and output, and repeating the  
4 transfer and output operations for each remaining line buffer and the remaining image data;  
5 and

6 a switch control circuit controlling said switch circuit so that each line buffer  
7 sequentially connects to the external circuit to output the image data to the external circuit.

1 20. A charge-coupled device (CCD), comprising:

2 a vertical CCD having a plurality of photosensors arranged in v vertical lines  
3 and n horizontal lines corresponding to an n x v frame of pixels, and converting optical  
4 signals to electrical signal image data;

5 a horizontal CCD having n line buffers, each buffer holding up to v pixels of  
6 image data;

7 a switch circuit connected to each of the vertical lines and the line buffers;

8 and

9 a switch control circuit controlling said switch circuit so that each line buffer  
10 sequentially connects to said vertical CCD, the image data in sequential ones of the n  
11 horizontal lines of said vertical CCD being transferred to a corresponding one of the n line  
12 buffers, and the image data in the n line buffers being output in parallel to the external  
13 circuit.

1           21. A charge-coupled device (CCD), comprising:

2                 an array of photosensors arranged in v vertical lines and n horizontal lines

3                 corresponding to an n x v pixel array of image data; and

4                 a plurality of n line buffers, each line buffer holding up to v pixels of image  
5                 data,

6                 wherein each line buffer sequentially connecting to said array, the image data  
7                 in sequential ones of the n horizontal lines of said array being transferred to a corresponding  
8                 one of the n line buffers, and each line buffer sequentially outputting the image data, the  
9                 image data in the line buffers being output in blocks of n x m ( $m < v$ ) pixels, each line  
10                buffer in each block outputting m pixels.

1           22. A charge-coupled device (CCD), comprising:

2                 an array of photosensors arranged in v vertical lines and horizontal lines

3                 corresponding to an n x v pixel array of image data, each horizontal line being divided into k  
4                 line sections, each line section corresponding to m ( $m < k$ ) pixels of image data; and

5                 a plurality of k line buffers, each line buffer holding up to m pixels of image  
6                 data,

7                 wherein blocks of n x m pixels of image data are transferred from the array of  
8                 photosensors to the line buffers, such that a first one of the buffers receives m pixels from a  
9                 horizontal line and outputs the m pixels before receiving another m pixels from the next

1 horizontal line and so forth until a first block of  $n \times m$  pixels has been transferred and  
2 output, and repeating the transfer and output operations for each remaining line buffer and  
3 the remaining image data.

1           23. A charge-coupled device (CCD), comprising:  
2                 an array of photosensors arranged in  $v$  vertical lines and  $n$  horizontal lines  
3 corresponding to an  $n \times v$  pixel array of image data; and  
4                 a plurality of  $n$  line buffers, each line buffer holding up to  $v$  pixels of image  
5 data,  
6                 wherein each line buffer sequentially connecting to said array, the image data  
7 in sequential ones of the  $n$  horizontal lines of said array being transferred to a corresponding  
8 one of the  $n$  line buffers, the image data in the  $n$  line buffers being output in parallel.

1           24. A method of outputting image data from a charge-coupled device (CCD),  
2 comprising:  
3                 arranging a plurality of photosensors in  $v$  vertical lines and  $n$  horizontal lines  
4 corresponding to an  $n \times v$  pixel array of image data;  
5                 connecting, sequentially, each one of a plurality of  $n$  line buffers to the array  
6 of photo sensors, each line buffer holding up to  $v$  pixels of image data, and transferring the  
7 image data in sequential ones of the  $n$  horizontal lines of the array to a corresponding one of  
8 the  $n$  line buffers; and

1                   outputting, sequentially, the image data of each line buffer, the image data in  
2                   the line buffers being output in blocks of  $n \times m$  ( $m < v$ ) pixels, each line buffer in each  
3                   block outputting  $m$  pixels.

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5                 25. A method of outputting image data from a charge-coupled device (CCD),  
6                   comprising:

7                   arranging a plurality of photosensors in  $v$  vertical lines and  $n$  horizontal lines  
8                   corresponding to an  $n \times v$  pixel array of image data;  
9                   dividing each horizontal line into  $k$  line sections, each line section  
10                  corresponding to  $m$  ( $m < k$ ) pixels of image data;  
11                  transferring blocks of  $n \times m$  pixels of image data from the array of  
12                  photosensors to a plurality of  $k$  line buffers, each line buffer holding up to  $m$  pixels of image  
13                  data, such that a first one of the buffers receives  $m$  pixels from a horizontal line and outputs  
14                  the  $m$  pixels before receiving another  $m$  pixels from the next horizontal line and so forth  
15                  until a first block of  $n \times m$  pixels has been transferred and output, and repeating the transfer  
16                  and output operations for each remaining line buffer and the remaining image data.

1                 26. A method of outputting image data from a charge-coupled device (CCD),  
2                   comprising:  
3                   arranging a plurality of photosensors in  $v$  vertical lines and  $n$  horizontal lines  
4                   corresponding to an  $n \times v$  pixel array of image data; and

1 connecting, sequentially, each one of a plurality of n line buffers to the array  
2 of photo sensors, each line buffer holding up to v pixels of image data, and transferring the  
3 image data in sequential ones of the n horizontal lines of the array to a corresponding one of  
4 the n line buffers, and outputting the image data in the n line buffers in parallel.